Macrobiotus montanus from California

(Tardigrada: Macrobiotidae)

ALBERT A. GRIGARICK, ROBERT O. SCHUSTER AND ELIZABETH C. TOFTNER
University of California, Davis 95616

Macrobiotus montanus Murray, 1910, previously unknown from California, was collected at Auburn, Placer County, California. It was the most common species of *Macrobiotus* occurring in the moss *Pseudobraunia californica* (Lesg.) Broth. and the lichen *Parmelia flaventior* Stirton, both found growing on rocks and small trees.[1]

The collections from which specimens of *M. montanus* were prepared for study were made in October and November of 1972. The tardigrades were washed from samples submerged in water for a few hours and recovered from a 325 mesh screen in a small amount of water. They were fixed in boiling 95% ethanol and either slide-mounted in Hoyer's or prepared for study by scanning electron microscopy. The latter specimens were dehydrated in absolute isopropanol, transferred to amyl acetate and critical-point dried using CO_2 at 980 psi. Specimens affixed to stubs with silver print were coated with 100Å each of silver followed by gold and were examined using the Cambridge Stereoscan electron microscope at the Davis Campus Facility for Advanced Instrumentation.[2]

Macrobiotus montanus was described originally from specimens collected at 6,000 ft., Nun's Veil Mtn., New Zealand. Ramazzotti (1972) records the species from Africa, Europe, the Galàpagos Islands and North America. Individuals of this California population are redescribed and illustrated in detail because the information obtained by electron microscopy is new and will allow more critical comparisons to be made with other populations.

The eggs of this species (Figs. 1A; 2C, D) are 77μ to 87μ in diameter and the hemispherical processes are about 6μ high, 9μ across and separated from each other by 0.8μ to 3.0μ. At the apices of the processes, and beneath their surfaces some regular structural features exist that may be mistaken for pores if observed with the phase microscope (Fig. 2D–p). The inter-process area of the shell is wrinkled and may have six to eight minute pores (obvious at 2,000 to 5,000 diameters).

Mature embryos and juveniles can be recognized using the key to

---

[1] Identifications provided by William A. Weber, University of Colorado Musuem, Boulder.
[2] Support for use of the Stereoscan was provided by Faculty Research Grant D141.

THE PAN-PACIFIC ENTOMOLOGIST 49: 229–231. July 1973

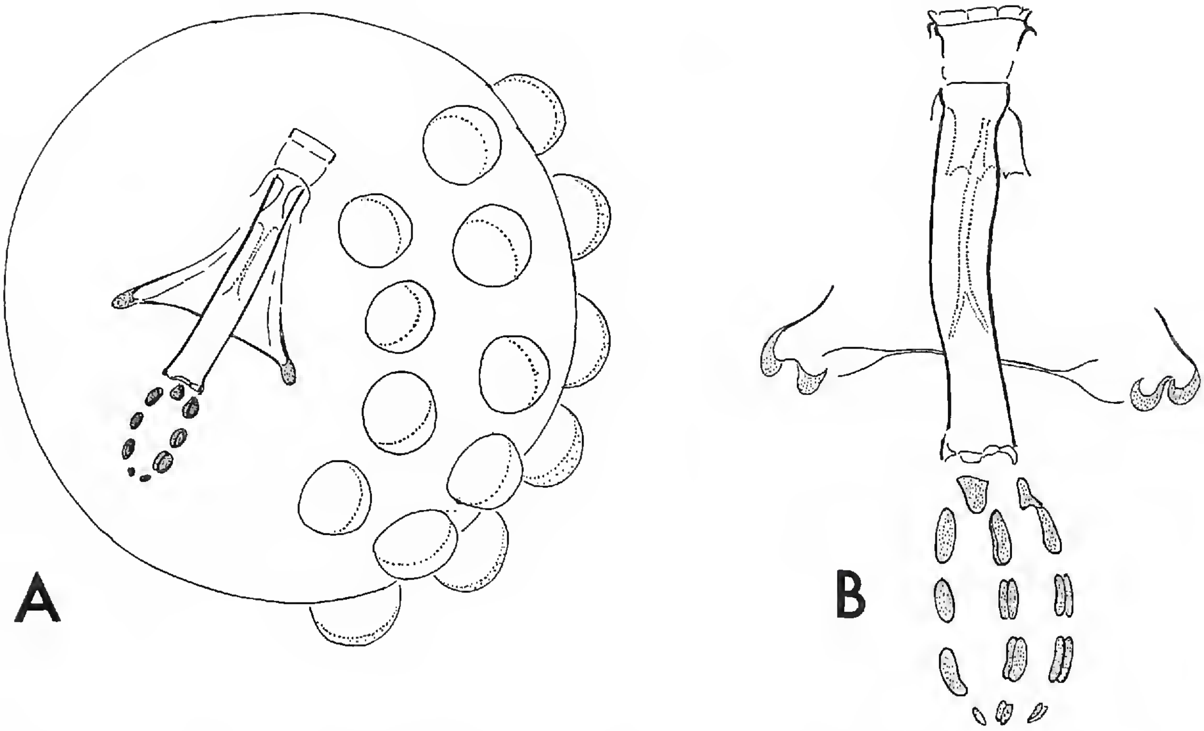

Fig. 1. A. Mouthparts within embryonated egg. B. Mouthparts of adult (specimen 500μ in length).

Macrobiotus in Ramazzotti (1972). However, in larger individuals macroplacoid II is visibly shorter than I or III (Fig. 1B) and these specimens will lead to *M. carsicus* in this key. To arrive at *M. montanus* in this key, the macroplacoids must be considered as being subequal in length and of oval shape, or observation must be limited to the smaller specimens. The cuticles of individuals ranging in size from the smallest (290μ) to the largest (550μ) were examined using the Stereoscan and the specimens were later slide-mounted to confirm their identity from conventional characters. All of the specimens possessed 10 buccal lamellae (Fig. 2E), the cuticle is somewhat wrinkled and while occasional small pores were found, they were not a conspicuous or regular feature. Distinct cribrate structures are present in the intersegmental creases (Fig. 2F–i). In an area dorsolateral to legs III the cribrate structures were observed frequently to be greatly enlarged. For all but the smallest individuals, a distinct granular area is present dorsally at the bases of legs IV (Fig. 2F–e).

Macrobiotus montanus is assigned to the "intermedius group" by Ramazzotti (1972). Present groupings may not reflect phylogenetic relationship because within this group *M. hufelandi* has 10 buccal lamellae as does *M. montanus* but *M. areolatus* has 12. Cuticular pores are characteristic of *M. hufelandi* but are inconspicuous or absent from *M. areolatus* and *M. montanus*. The accumulation of additional infor-

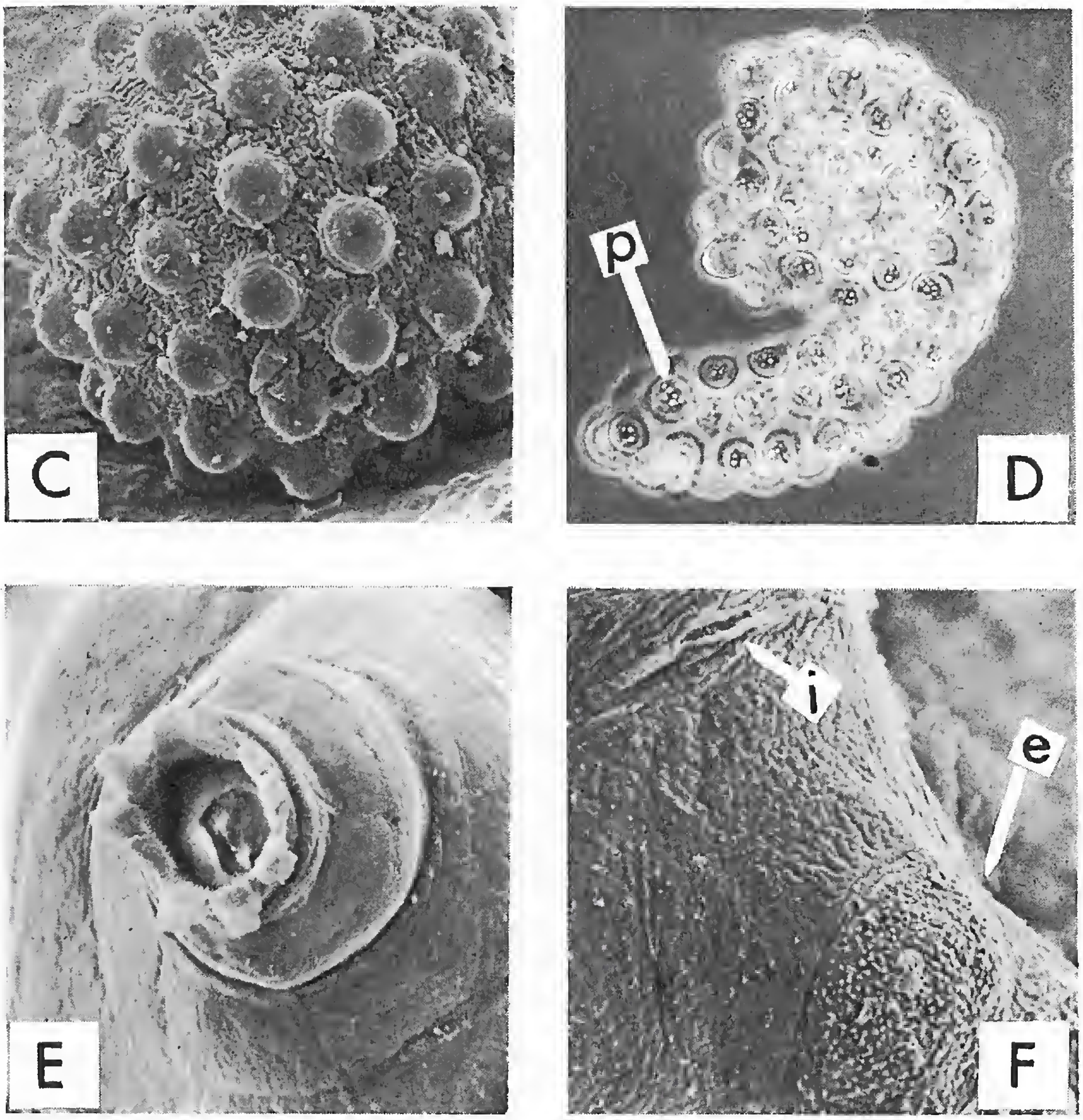

FIG. 2. C. Scanning electron photograph of egg, 600×. D. Structure of ruptured egg recorded by phase microscopy, 375×. E. Scanning electron photograph of buccal opening, 1,585×. F. Scanning electron photograph of cuticular morphology of dorsum, 1,975×.

mation resulting from electron microscopy will better define the species of *Macrobiotus* and will hopefully provide information by which their relationships can be re-evaluated.

LITERATURE CITED

MURRAY, J. 1910. Tardigrada. British Antarctic Exped. 1907–9 under command of Sir E. H. Shackelton, C.V.O. Reports on the Scientific Investigations 1 to 5 (83–185 pls. XIV–XXI).

RAMAZZOTTI, G. 1972. Il Phylum Tardigrada. Mem. Ist. Ital. Idrobiol. Dott Marco de Marchi, Pallanza Italy, 28: 1–732.